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Gender HCI Issues in Problem-Solving Software

Margaret Burnett, Oregon State University
Project Director, EUSES Consortium

A New Research Area: End-User Software Engineering



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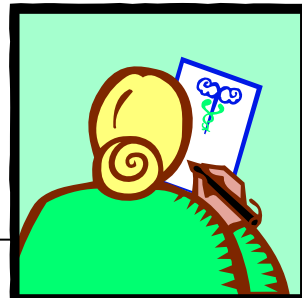


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Is it possible to bring the benefits of rigorous software engineering methodologies to end users?





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Outreach & Building Community

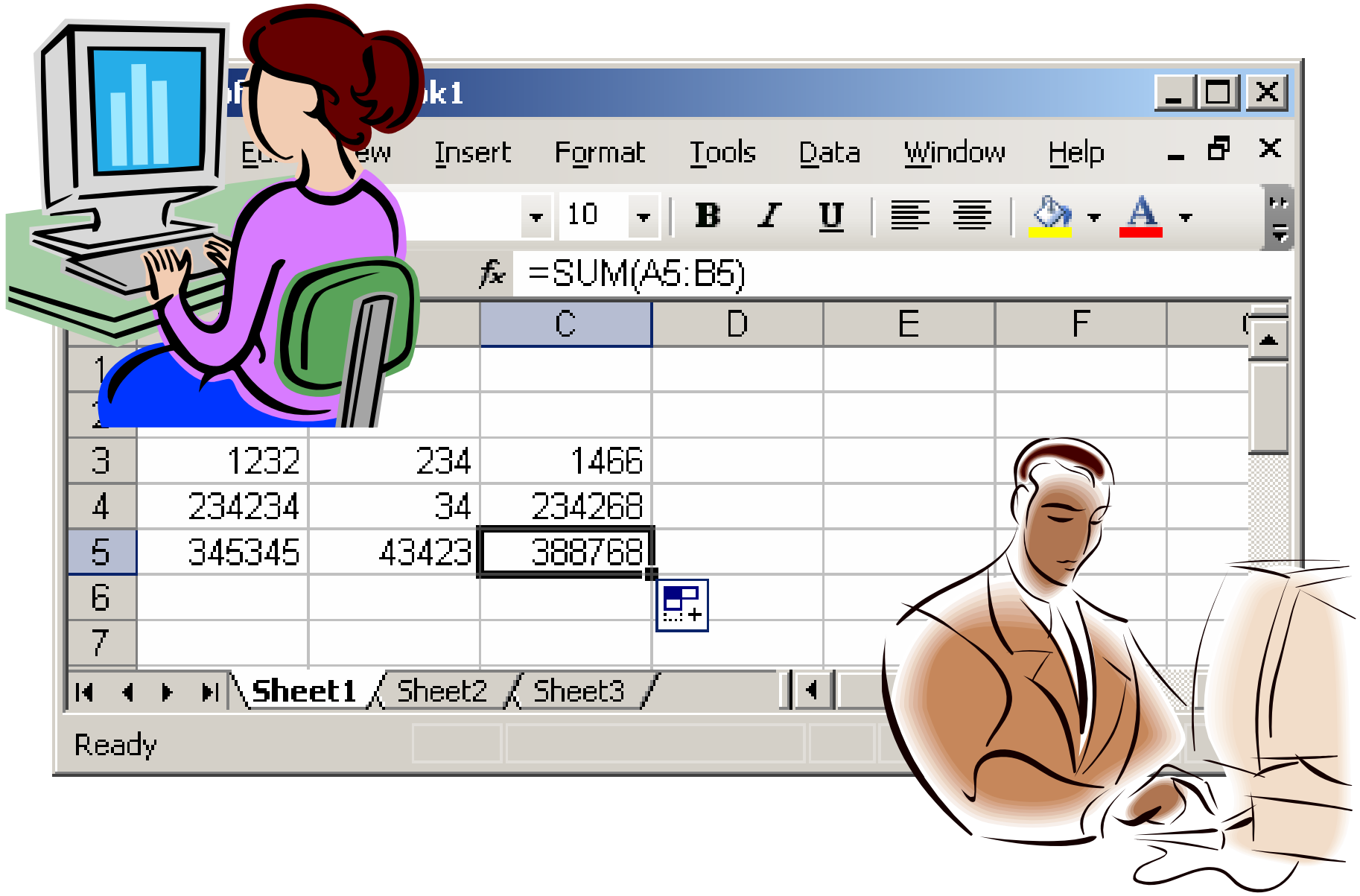
K-12 education: quality control mindset

- Research in curriculum change
- Mathematics education conferences, book
- K-12 teachers
- K-12 students (Saturday Academy)
- High school researchers

Building research community

- Public bibs, many talks, many papers.
- Community-building events: SIGs, Spreadsheet workshop, Educ. workshops, WEUSE I, WEUSE II. (More to come...)

Gender Differences??





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So What?

Pipeline:

- Unsuccessful early experiences with software will not lead to computing careers.

Success:

- Limiting experiences with software impose yet another barrier to success.





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Activities and Research Paradigm

1. Derive hypotheses from theories.
 - Gender differences + software features.
2. Refine/test hypotheses empirically.
3. Use results to redesign prototype.
4. Evaluate empirically, iterate.



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Results to Discuss Today



Self-efficacy – an individual's belief in their ability to complete a specific task

1. Self efficacy (CHI'05).
2. Specific relationships of SE+gender to software features (CHI'05).
3. Ties to tinkering (CHI'06).



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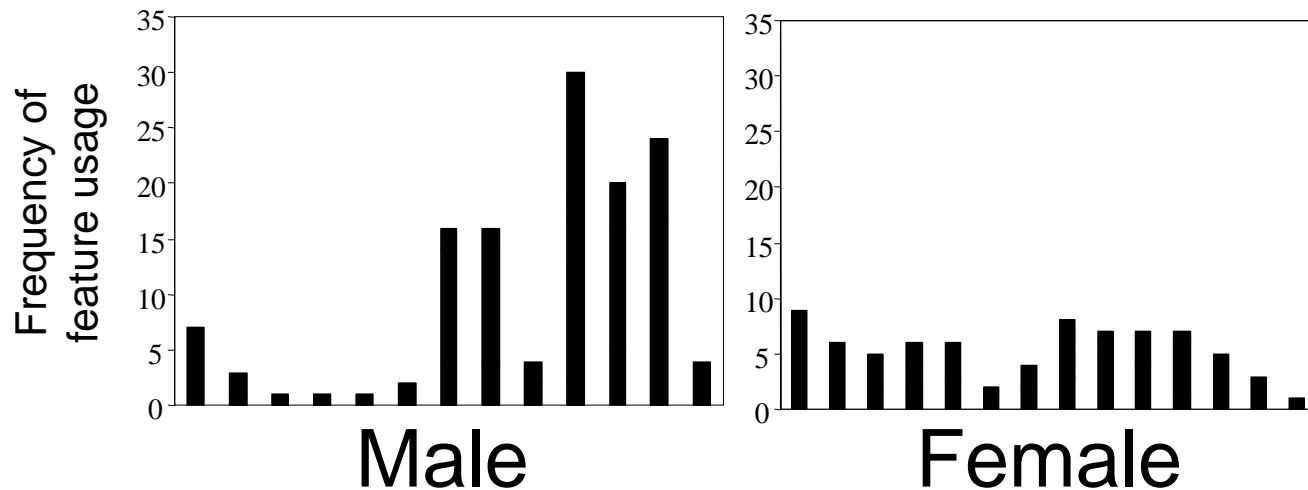
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Feature Acceptance

Types of acceptance

- Willingness to approach.
- Willingness to adopt.

Early qualitative evidence – Activity Patterns





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Experiment



End-user problem solving setting

0% Tested

0% bug likelihood

81.25	100	81.25	96	100	82
Quiz1	Quiz2	Min_Quiz1_Quiz2	Quiz3	Quiz4	Quiz5
45	90	90	90	88	90
Midterm1	Midterm1_Perc	Midterm2	Min_Midterm1_Midterm2	Midterm3	Curved_Midterm3
120	82.1918		94.5	90	87.3973
Final	Final_Percentage		Quiz_Avg	Midterm_Avg	Exam_Avg
				75.4438356164	C
				Course_Avg	Course_Grade

Task: Find and Fix Bugs



Experiment – Features

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Type familiar: formula edits.

Type taught: ✓, →.

Type untaught: ✗.

82.1918 [?]

Final_Percentage

Hide Apply

Final / 146 * 100

90 [?] → 86.0959 [✓]

Midterm_Avg [↓] Exam_Avg [↓]

67.883835 [?] D [?]

Course_Grade [↓]

75.6 [?] Quiz_Avg [↓]

90 [?] Midterm [↓]

86.0959 [✓] Exam_Avg [↓]

67.883835 [✗] Course_Avg [↓]

D [?] Course_Grade [↓]

BUG LIKELIHOOD: LOW -- Tinted cells show bug likelihood. Check for formula bugs, OR look at other tinted cells, OR check and X other cells to get more feedback.



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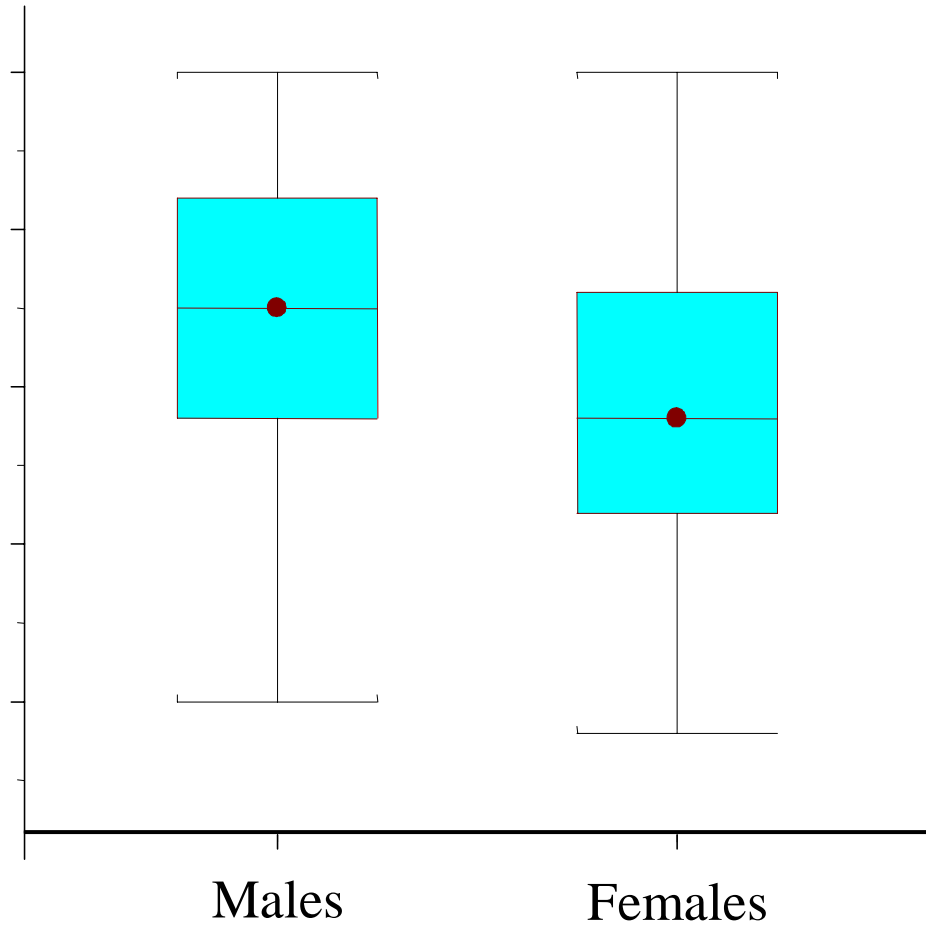
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Results – Self-Efficacy ($p < 0.018$)





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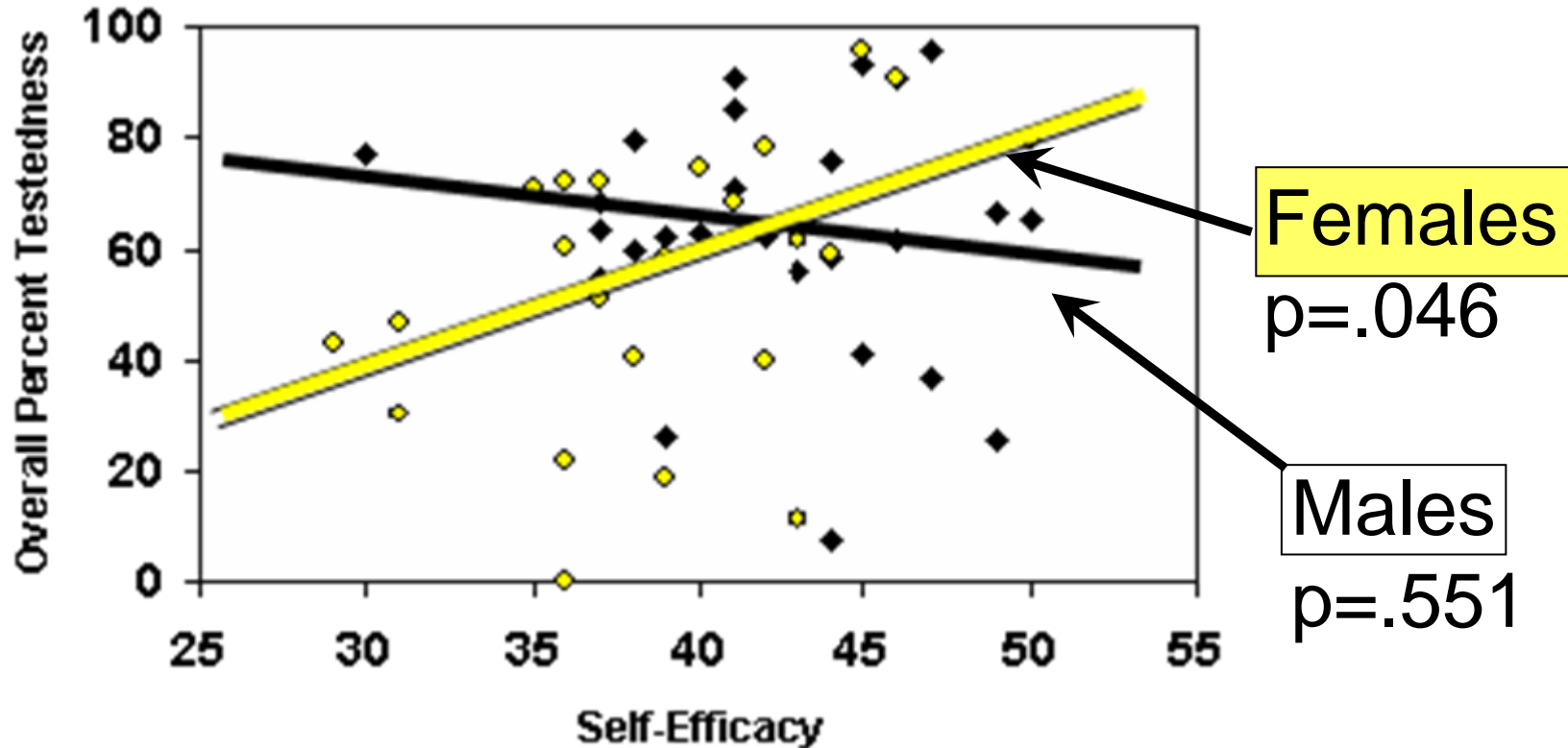
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Results – Self-Efficacy as Predictor (Effective) Use





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Their Goal: Find and **Fix Bugs**

Gender	Seeded Bugs Fixed	New Bugs Introduced
Males	5.815 (2.167)	.111 (.424)
Females	5.667 (2.014)	.583 (.974)

↑
No difference
 $p=.651$

↑
Difference
 $p=.011$



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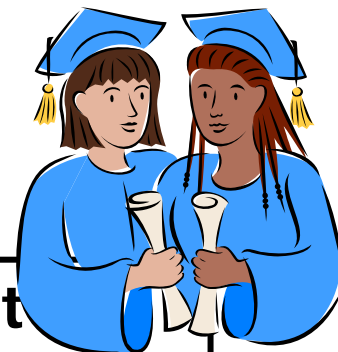
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Results – Adoption



Gender	Familiar Features $p < .03$	Taught Features $p < .03$
Males	23.8 (9.58)	123.41 (68.27)
Females	29.8 (9.66)	87.54 (47.67)

Gender $p < .01$	Untaught Features Used by...	Untaught Features Not Used by...
Males	22	5
Females	11	13



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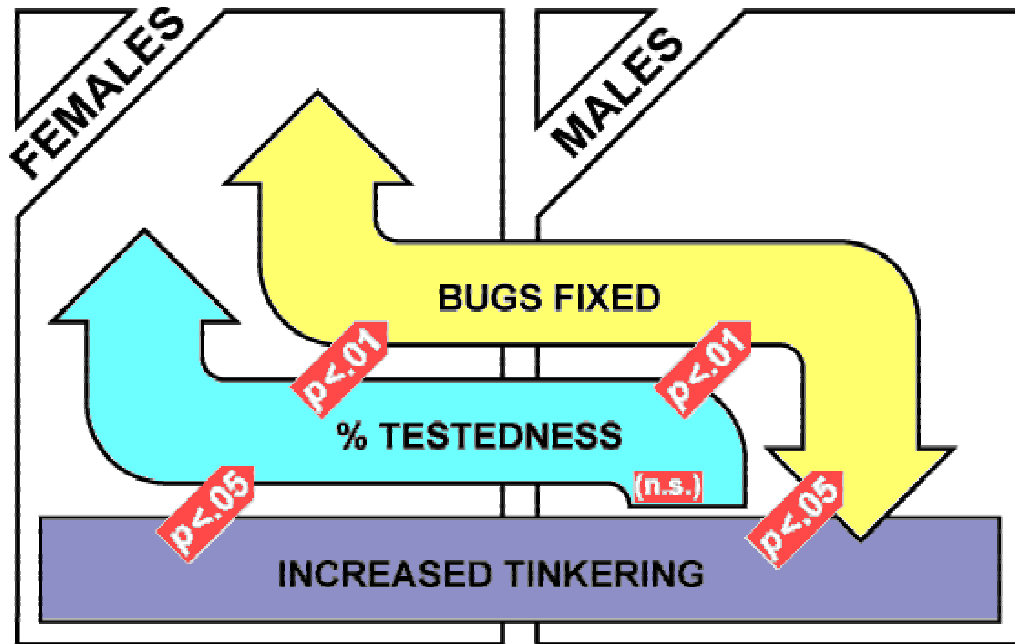
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Tinkering (details at CHI'06)

Tinkering pausefully is good for everyone (and helps self-efficacy).

When females tinker, it's pauseful.

Males can get "addicted".





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Some Emerging/Future Work



Do these results generalize?

- In progress: many additional studies, including commercial environment (Excel).

Aspects of interest/use to males/females?

- New types of built-in explanations? (Qualitative results, more work in progress)
- Features that are useful/used by just one gender?
 - Which are those? In progress: qualitative work, data mining, ...



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Some Conclusions So Far

Females lower self-efficacy

- Self-efficacy predictive of effectiveness.
- Not true of males.

Females less likely to accept new features

- Opinion: too long to learn.
- But: no difference in learning!

Appear to be different features that attract males vs. females.

Tinkering: helps females. Males sometimes hurt themselves with it.

